PATENT SPECIFICATION (11) 1 362 514

(21) Application No. 436/73 (22) Filed 16 March 1970 (19)

(62) Divided out of No. 1 362 513

(23) Complete Specification filed 16 June 1971

(44) Complete Specification published 7 Aug. 1974

(51) International Classification B66D 1/26

(52) Index at acceptance

B8B 48E 52

1 362 514

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(54) IMPROVEMENTS IN OR RELATING TO WINCHES

(71) We, TELEFLEX LIMITED, a British Company of Christopher Martin Road, Basildon, Essex, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to winches.

According to the present invention there is provided a winch for a lifting cable, comprising a main cable-winding and cable-storage drum, first, second and third pulleys, a drive motor for driving said drum and each of said first, second and third pulleys through a gear means, a lifting cable adapted to be wound on said drum and looped sinuously about said first, second and third pulleys, an idler pulley and a tension control pulley, each engaging said lifting cable, the path of said cable being defined by said first, second and third pulleys and said idler pulley and said tension control pulley, said tension control pulley being displaceable by said cable in response to the tension in said cable, said tension control pulley operatively being connected to a tension-indicating signal generating means, said signal generating means generating a signal in response to the tension in said cable to control the speed of only said storage drum thereby maintaining the tension in said cable at a substantially constant level.

The winch has been particularly designed for handling a lifting cable in which high tensile material is embodied in a composite web or strap of comparatively wide, thin ribbon-like configuration such that it winds on to the storage drum like a tape without twisting. This lifting cable may comprise a plurality of individually flexible high tensile cords or filaments, e.g. steel strips, contained in a more or less flat strip or web of a flexible encasing or covering medium, e.g. of synthetic plastics material, which maintains the cords or filaments in mutually separated positions.

The manner of carrying the invention into effect will now be described in more detail with reference to the accompanying drawings, in which:—

Figure 1 shows a cable in diagrammatic cross section;

Figures 2 and 3 illustrate a different form of cable;

Figure 4 shows another modification of the cable;

Figure 5 illustrates yet a further cable form; and

Figure 6 is a diagram of a winch, embodying the invention, for winding such cables.

As shown in Figure 1, a lifting cable comprises a multiplicity of high tensile stranded steel cords 15, disposed side by side in a row and spaced from one another, these cords being encapsulated in a synthetic plastics medium 16, such as polyurethane. The cords may be introduced into the plastics medium by an extrusion process, preferably with preheating of the cords just prior to their entry into the extrusion head to ensure intimate bonding of the steel wires and the plastic. Purely by way of example, in one web there may be 19 encapsulated steel cords each consisting of a king wire, 6 wires helically wound on the king wire with a right hand lay at 2.0″ pitch and 12 further wires wound on with a left hand lay at 4.0″ pitch, all the wires being 0.022″ diameter 100/120 ton tensile steel and the finished cord being roll-formed to a diameter of 0.1″. Other numbers of cords, and types of cord composition may, of course, be employed.

However, it is not necessary that the cords should be of steel: other high tensile fibres may be employed, such as nylon, Terylene (Registered Trade Mark), glass or carbon fibres, encapsulated in any appropriate plastics or elastomeric medium .

In Figure 1, the web is shown moulded with shallow longitudinal channels 17 in its wide faces but this is not essential.

Figures 2 and 3 show a form of lifting cable 26 containing more than one layer of steel cords 27. To make this cable 26 single

layers of cords 27 are first individually precoated and encapsulated in the flexible plastics medium 28 to form strips 29 as in Figure 2. Then a number of these strips are put together to build up a laminated cable and are finally encased in an outer surrounding layer of plastics medium 30 as shown in Figure 3. In this example the completed cable 26 contains three individual precoated layers of cords 27 but there could be more or less than three.

In Figure 4 a modification is shown in which the steel cords 31 of an individual layer, encased in plastics medium 32, are staggered alternately up and down. Such a staggered formation can be employed in a single layer cable of the Figure 1 type or in a multi-layer laminated cable of the type shown in Figures 2 and 3.

Figure 5 shows a further modification in which flat steel strips or filaments 33 are employed instead of round cords. In the particular arrangement illustrated, single strips or filaments situated on the central lateral plane of the cable 34 alternate across the width of the cable with pairs of filaments disposed one on either side of said plane. But other arrangements are possible, including dispositions in which the filaments are in overlapping relationship across the width of the cable. The individual filaments 33 may, for example, be 10mms wide and 1mm thick with rounded edges 35. Such a cable 34 can be used alone, or employed as one of the individual layers in a laminated cable of the general type shown in Figures 2 and 3.

Lifting cables as described provide good flexibility in both longitudinal and axial planes while resisting to a high degree the twisting of the loads carried that is a characteristic of conventional cables of generally round configuration. Moreover, the handling of the cable is improved, as is also the design of shrouded sleeves and winding drums therefor. Due to the wide area of contact between the cable and any driving drum or pulley around which it passes slip is minimised. This reduces wear on the encapsulating medium of the cable; the encapsulated load-bearing elements do not wear as they are in contact neither with the members of the handling gear nor with one another.

In view of the high degree of frictional engagement between the cable and each drum or pulley around which it passes, it is particularly suited to progressive off-loading of tension by passage round a succession of power-driven pulleys. Figure 6 shows a winch comprising a main winding or cable-storage drum 18 and a succession of pulleys 19, 20, 21 around which the cable 22 is looped sinuously in its path to the drum, there being a substantial arc of contact maintained at each pulley. The drum and each of these three pulleys is power-driven from the same drive motor through a gear train, with the result that each sustains a portion of the load and there is a progressive off-loading of cable tension as the drum 18 is approached. In this way, an initial cable tension in excess of 8000 lbs can be reduced to a figure in the order of 1000 lbs or less at the drum.

In addition to the driven pulleys, the arrangement includes an idler pulley 23, and a tension control pulley 24 which engages the cable stretch between the driven pulleys 20 and 21 and sends a tension-indicating signal to a speed control device that varies the speed of only the storage drum 18 to allow for the changing effective diameter of this drum as cable is wound on and thereby maintain the tensions in the cable substantially constant.

Attention is drawn to our copending parent Patent Application No. 12587/70 (Serial No. 1,362,513) from which the present application is divided which discloses the same subject matter but which claims the cable both *per se* and in combination with the winch.

WHAT WE CLAIM IS:—

1. A winch for a lifting cable comprising a main cable-winding and cable-storage drum, first, second and third pulleys, a drive motor for driving said drum and each of said first, second and third pulleys through a gear means, a lifting cable adapted to be wound on said drum and looped sinuously about said first, second and third pulleys, an idler pulley and a tension control pulley, each engaging said lifting cable, the path of said cable being defined by said first, second and third pulleys and said idler pulley and said tension control pulley, said tension control pulley being displaceable by said cable in response to the tension in said cable, said tension control pulley operatively being connected to a tension-indicating signal generating means, said signal generating means generating a signal in response to the tension in said cable to control the speed of only said storage drum thereby maintaining the tension in said cable at a substantially constant level.

2. A winch as claimed in claim 1, wherein the tension control pulley is located between two of the first, second and third pulleys in said path.

3. A winch substantially as herein described with reference to Figure 6 of the accompanying drawings.

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Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1974.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY
from which copies may be obtained.

1362514 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

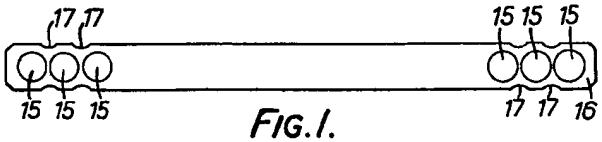

FIG. 1.

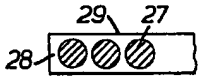

FIG. 2.

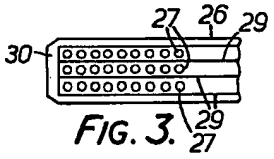

FIG. 3.

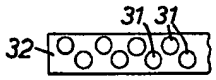

FIG. 4.

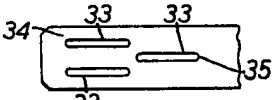

FIG. 5.

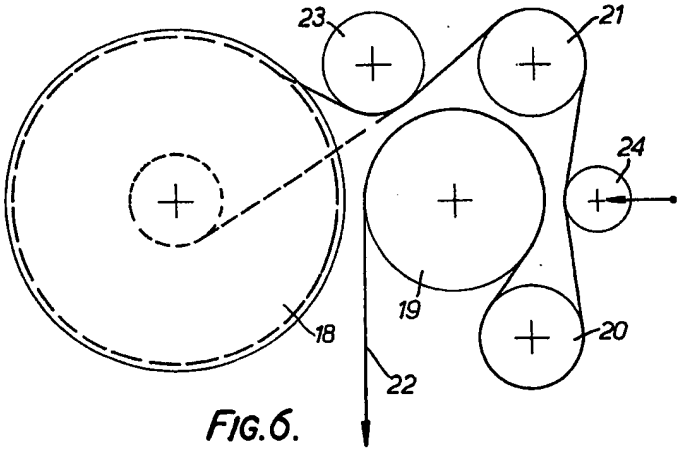

FIG. 6.